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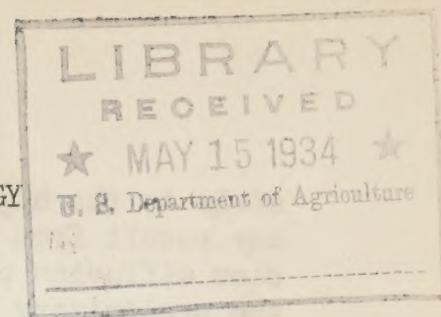
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FRUIT INSECTS

West Indian fruit fly work transferred to Puerto Rico.---Intensive inspections in Key West have failed to disclose field infestations of either of the West Indian fruit flies, Anastrepha acidusa Walk. and A. suspensa Loew, since early in the fall and indicate that the eradication campaign being carried on by the State Plant Board of Florida will be successful. In keeping with this effort to eradicate the fruit flies, all individuals that had been used in experiments were killed early in November 1933. The station at Key West, maintained in cooperation with the Florida State Plant Board since November 1932, was discontinued in December 1933. There is a definite need for more information on the habits of these fruit flies and the effect various poisons have on them. L. C. McAlister, Jr., has been transferred to Puerto Rico where, through the cooperation of the Office of Experiment Stations, he will be furnished quarters at Mayaguez. He will continue to carry on studies to test the effectiveness of various poison sprays, attractants, etc.

Tartar emetic has little effect on the maturity or quality of citrus fruits.---W. W. Yothers, in charge of the laboratory at Orlando, Fla., in cooperation with other bureaus of the Department, has been studying the effect of tartar emetic on the time of maturity and the composition of citrus fruits. Tartar emetic is an effective poison in fruit-fly baits and if it does not injure fruit may be one of the sprays that can be used on citrus. Analyses just completed show that the presence of tartar emetic has no effect on the maturing of the fruit.

"Protective stupefaction" caused by light dosage of hydrocyanic acid gas.---F. H. Lathrop, in charge of the Whittier, Calif., laboratory, has just conducted a number of experiments, in cooperation with H. L. Cupples, of the Bureau of Chemistry and Soils, to determine the importance of "protective stupefaction" in fumigation operations. In recent years a number of workers have found that if the California red scale (Chrysomphalus aurantii Mask.) and several other species of scale insects are first exposed to a sublethal concentration of cyanide gas and then exposed to the normal lethal dosage the percentage of kill is distinctly less than when the scales are exposed immedi-



ately to the higher concentration. In actual practice this condition may result from the drift of gas from nearby fumigation tents or by a slow diffusion of gas within a tent. In the experiments conducted the preliminary treatment was varied with respect to the cyanide dosage and the duration of exposure. Following these preliminary treatments the scales in all experiments were given a standard fumigation treatment. The results appeared to confirm the observations of previous workers. Protective stupefaction was induced by low concentrations of cyanide in both the resistant and nonresistant stages of the red scale. An interesting and somewhat surprising conclusion is that the percentage of scales surviving the treatment was inversely proportional to the concentration of cyanide used in the preliminary experiment. In other words, the lower the concentration of cyanide used in the preliminary treatment, the more completely the scales were protected from the later higher concentration. Exposure to the air for periods as long as 32 minutes following the preliminary exposure to sublethal doses failed to counteract the protective effect of the preliminary treatment.

Bureau laboratory at Experiment, Ga., taken over by Georgia Experiment Station.--Because of curtailment in funds, it has been found necessary to discontinue the pecan insect investigations formerly conducted at Experiment, Ga. This work was conducted in cooperation with the Georgia Experiment Station, which furnished the necessary quarters and facilities. With the withdrawal of Federal funds, the work has been taken over by the Georgia Experiment Station, which is financing the whole project, with the exception of a nominal allotment of Bureau funds for certain minor expenses. T. L. Bissell is being continued on the work under the new arrangement and is now a Collaborator of the Bureau of Entomology.

#### JAPANESE AND ASIATIC BEETLES

Effects of summer drought on Jap beetle abundance.--H. Fox reports that in a study of the changes in populations of Popillia japonica Newm., as followed from year to year in three of the small parks or "squares" in the central business section of Philadelphia, it was found that the fluctuations observed were clearly correlated with the rainfall of the preceding summer. A similar correlation was also found in the case of numerous other localities situated near Philadelphia. During the few years in which the populations in that city were growing largely by accessions from outside sources, no clear correlation between rainfall and population was evident, but once the population reached a stage at which it was numerically equivalent to populations outside the city limits, subsequent change was clearly connected with summer rainfall. The pertinent evidence on this point, as regards the small park populations of Philadelphia, is summarized in the following table.



Comparison of summer rainfall and Japanese beetle populations in soil at Philadelphia

| Year | Summer rainfall |                        | Year | Spring population      |         |         |
|------|-----------------|------------------------|------|------------------------|---------|---------|
|      | Quantity        | Deviation from average |      | Larvae per square foot |         |         |
|      | Inches          |                        |      | Average                | Minimum | Maximum |
| 1926 | 17.20           | +4.97                  | 1927 | 4.4                    | 0       | 12      |
| 1927 | 15.25           | +3.02                  | 1928 | 7.0                    | 0       | 24      |
| 1928 | 15.84           | +3.61                  | 1929 | 9.2                    | 1       | 38      |
| 1929 | 7.49            | -4.74                  | 1930 | 2.9                    | 0       | 19      |
| 1930 | 10.53           | -1.70                  | 1931 | 6.9                    | 0       | 36      |
| 1931 | 17.74           | +5.51                  | 1932 | 9.6                    | 0       | 61      |
| 1932 | 8.71            | -3.52                  | 1933 | 4.6                    | 0       | 33      |

The fact that markedly deficient summer rainfall is followed by greatly reduced beetle populations suggests the thought that summer drought may serve as an effective influence in limiting Japanese beetle colonization to those sections of this country in which rainfall during the summer normally exceeds 6 inches.

Control of adult Jap beetle by means of mechanical traps.---A report on the work at Cape Charles, Va., has been completed by F. W. Metzger, who summarizes it as follows: During the summer of 1933 trapping for the Japanese beetle at Cape Charles, Va., was carried on by the Japanese beetle laboratory, to obtain further data on the effectiveness of the soil treatments applied in previous years by the Bureau of Plant Quarantine. A total of 1,796 beetles were captured in 1933 in 500 traps, as compared with 1,636 in 1932. Of this number, 1,178 beetles, or 65.5 percent, were captured in the area treated with lead arsenate. In 1932, 1,396, or 85.3 percent, of the total were taken in the same area. In 1933, 618 beetles, or 34.5 percent, were taken in the untreated area, as against 240, or 14.6 percent, taken in 1932. A total of 1,650 beetles, or 91.3 percent, of all captured were taken in the traps in 1933, the remainder being caught by hand. No beetle injury was visible at Cape Charles, even in the localities where it was captured in the largest numbers. The infestation is still very localized within the town, since 4.6 percent of the traps captured 32.3 percent of all the beetles so taken. Despite a diligent search, no beetles were found outside the limits of the town of Cape Charles.

Control of Jap beetle in turf.---A report submitted by M. R. Osburn covering the experimental work at Swarthmore College, Swarthmore, Pa., reads as follows: In October 1931, or three months following the first application of materials, examinations for the presence



of Japanese beetle larvae were made in the plots which had received one application of the various materials. In making these examinations, a square foot of turf was lifted and the soil examined carefully to a depth of 6 or 8 inches for the presence of larvae at regular designated stations in each plot. At least 30 examinations were made in each plot. Subsequent examinations of the various plots were made in the spring and fall of 1932 and the spring of 1933. Points in each plot were designated for examinations so that subsequent examinations would not be made in areas previously examined, but in close proximity to them, as larval infestation varies greatly and it was desired to get results that would be more comparable than if the examinations were made at random in each plot. The following table gives the materials used, the rate of application, the number of applications made, and the average number of larvae found in at least 30 square feet of soil in each treated and untreated plot.

Results of insecticidal applications to destroy larvae of the Japanese beetle in the turf, Swarthmore, Pa., 1931-33

| Material         | Dosage per<br>1,000<br>square<br>feet | Date of<br>application | Average number of larvae<br>per square foot found in |              |                 |             |
|------------------|---------------------------------------|------------------------|--|--------------|-----------------|-------------|
|                  |                                       |                        | October<br>1931                                      | June<br>1932 | October<br>1932 | May<br>1933 |
| Untreated        | ---                                   | ---                    | 31.0   | 24.0         | 5.06            | 2.36        |
| Lead arsenate    | 5 lbs.                                |                        |  |              |                 |             |
| Activated sludge | 10 "                                  | July 1931              | 9.2  | 5.0          | 0.53            | 0.26        |
| Sand             | 20 "                                  |                        |  |              |                 |             |
| Lead arsenate    | 5 "                                   | July 1931              |  |              |                 |             |
| Activated sludge | 10 "                                  | October 1931           | --   | 2.8          | 0.06            | 0.00        |
| Sand             | 20 "                                  |                        |  |              |                 |             |
| Lead arsenate    | 5 "                                   | July 1931              |  |              |                 |             |
| Activated sludge | 10 "                                  | October 1931           | --   | --           | 0.00            | 0.00        |
| Sand             | 20 "                                  | May 1932               |  |              |                 |             |
| Lead arsenate    | 5 "                                   |                        |  |              |                 |             |
| Tankage          | 10 "                                  | July 1931              | 9.6  | 1.6          | 0.23            | 0.26        |
| Sand             | 20 "                                  |                        |  |              |                 |             |
| Lead arsenate    | 5 "                                   | July 1931              |  |              |                 |             |
| Tankage          | 10 "                                  | October 1931           | --   | 0.7          | 0.00            | 0.00        |
| Sand             | 20 "                                  |                        |  |              |                 |             |



Results of insecticidal applications to destroy larvae of the Japanese beetle in the turf, Swarthmore, Pa., 1931-33 (Con.)

| Material      | Dosage per<br>1,000<br>square<br>feet | Date of<br>application | Average number of larvae<br>per square foot found in |              |                 |             |
|---------------|---------------------------------------|------------------------|--|--------------|-----------------|-------------|
|               |                                       |                        | October<br>1931                                      | June<br>1932 | October<br>1932 | May<br>1933 |
| Lead arsenate | 5 lbs.                                | July 1931              |  |              |                 |             |
| Tankage       | 10 "                                  | October 1931           | --   | --           | 0.1             | 0.00        |
| Sand          | 20 "                                  | May 1932               |  |              |                 |             |
| Lead arsenate | 5 "                                   | July 1931              | 16.0   | 10.0         | 0.2             | 0.16        |
| Water         | 10 gals.                              |                        |  |              |                 |             |
| Lead arsenate | 5 lbs.                                | July 1931              | --   | 4.0          | 0.13            | 0.06        |
| Water         | 10 gals.                              | October 1931           |  |              |                 |             |
| Lead arsenate | 5 lbs.                                | July 1931              |  |              |                 |             |
| Water         | 10 gals.                              | October 1931           | --   | --           | 0.13            | 0.00        |
|               |                                       | May 1932               |  |              |                 |             |

Hibernation of Tiphia sp. #6-b.---The hibernation habits of this species of Tiphia are quite different from those of any other species so far encountered, according to L. B. Parker and R. W. Burrell. Observations so far indicate that the females emerge in the fall and mate, after which they enter hibernation. A number of these hibernating females are being held under varied conditions at this time. A few were recently removed from hibernation and tested for oviposition late in November; only one female deposited eggs at intervals until December 22. Apparently the hibernation period must be longer before successful propagation of this species can be undertaken.

TRUCK CROP AND GARDEN INSECTS

Difficulties in wireworm work greatly reduced by morphological data on larvae.---M. C. Lane and H. B. Lanchester, of the Walla Walla, Wash., laboratory, report good progress on a morphological study of the various species of wireworms occurring in that territory. The difficulty in work with wireworms in the past has been greatly increased because it has not been possible to determine the larvae accurately; thus it has not been possible to determine definitely which species was under observation at the time. The long life cycle of these insects, together with the difficulties encountered in rearing field-collected larvae, make it impractical to wait for the development of adults before the determination of species. Preliminary studies and drawings of 12 species of the larvae of wireworms oc-



curing in the agricultural areas of the Pacific Northwest have been made and the preparation of a key for their determination is in progress.

Physiological studies furnish information regarding digestion and sexual maturity of wireworms.--C. E. Woodworth, Walla Walla, reports that in the study of digestion by wireworms four major observations have been made, each of which is being studied in some detail. These observations are: (1) Some foods are partially digested before being taken into the body; (2) foods are usually taken into the body in solution or in the colloidal state; (3) digestion is aided in the mid-intestine by the procedure known as strangulation of the tract cells; (4) bacteria usually play an important part in the economy of digestion for food utilization. In this picture the fat bodies are of great importance and starch is changed to fat in a remarkably short time. Much work is still to be done and the information on the details of these processes is very fragmentary. C. E. Woodworth further reports that in life-history studies it has recently been found that unexpectedly low temperatures favor the development of the ovaries. Of all the temperatures tried, 63.5° F. was the most advantageous. Spermatazoa have been demonstrated in the testes as early as the first of October, but were not found in the lateral horns of the seminal vesicle until about the end of October. Sperm has not been demonstrated as yet in the main body of the seminal vesicle. From observations on egg and sperm development, it seems that there is little chance of a fall flight, a considerable period of relatively low temperatures being necessary for good development of eggs.

Naphthalene treatment for wireworm control gives favorable results.--R. S. Lehman, Walla Walla, reports that "The results obtained from crude naphthalene as a fumigant in the field against wireworms during the past season were quite satisfactory. Up to the present time with concentrations of 800 pounds of crude naphthalene to the acre, mortalities of from 60 to 90 percent have been obtained. This wide range is probably due to the variations in soil texture, moisture, and temperature, and to the mixture of naphthalene with the soil in the various fields. It should be understood that these experiments were conducted under a variety of conditions, some favorable and some very unfavorable, so a wide variation is to be expected." Crude naphthalene may be obtained f. o. b. Walla Walla at a cost of \$28 per 100 pounds. The cost at Philadelphia, Pa., and Portland, Oreg., would be \$16 and \$22, respectively. When it is considered that one treatment will suffice for at least 2 years and possibly much longer, the cost per acre per season is relatively low.



Mite infestation of bush blackberries apparently increases yield.---S. E. Crumb, of the Puyallup, Wash., Laboratory, reports that "Results of the experiment on the Texas bush blackberries within the limits observed indicate that the yield tended to increase as the redberry mite (Eriophyes essigi Hassan) increased. Thus, with an average of 18 mites per berry, the yield was 281 pounds per row, while with an average of 666 mites per berry, the yield was 403 pounds per row. Normally the Texas blackberry is subject to a heavy drop because the fruit clings but slightly to the calyx. In the Evergreen and Himalaya varieties of blackberries, mite infestation causes the fruit to cling strongly to the calyx. Apparently mite infestation on the Texas blackberry is beneficial in that the infestation causes the berries to cling, thus reducing the amount of loss due to drop.

Wind probably important in spread of redberry mite.---S. E. Crumb also reports that a study of the spread of E. essigi during the fall shows that the mite has spread from 1 to 4 miles from centers of infestation since the examination a year ago and has appeared in some isolated spots in which it is somewhat difficult to account for the origin of the infestation, unless the mites were carried by the wind. The importance of wind as an agency in distribution is further indicated by the fact that spread seems less rapid toward the north, the prevailing wind being from the northwest. Several additional infestations of wild Evergreen and Himalaya blackberries were found this season.

Fluorine compounds found of value in control of lima bean pod borer.---Rodney Cecil, Ventura, Calif., reports favorable results in control of the lima bean pod borer (Etiella zinckenella Treit.) through the use of both barium fluosilicate and sodium fluoaluminate. These materials give considerably better results than any of a considerable series of materials tried. The following tabulation gives the seasonal average of the effectiveness of these two materials.

| Insecticide                         | Average pods per plant | Pods wormy     |
|-------------------------------------|------------------------|----------------|
|                                     | <u>Number</u>          | <u>Percent</u> |
| Barium fluosilicate, 80% . . . . .  | 89.77                  | 20.04          |
| Sodium fluoaluminate, 80% . . . . . | 82.44                  | 17.25          |
| Check . . . . .                     | 11.00                  | 89.61          |

Preliminary work indicates that these insecticides will also give effective control of the bean leaf skeletonizer (Autographa egea Guenee). Magnesium arsenate, lead arsenate, or calcium arsenate will not kill the larva of this insect.



Flood results and damage to agriculture in southern California.--  
R. E. Campbell, of the Alhambra, Calif., laboratory, makes the following comments in regard to the recent flood: "While the damage from flood waters was largely in the residential districts, incomplete reports so far show some agricultural losses. About 1,000 acres in the Venice district were flooded, and probably much of this will be covered with mud. Mature celery on 300 acres will be a total loss. There was some loss from flooding in the Long Beach area, but a survey of this will not be completed for several days. East of Pasadena about 1,000 acres of citrus was damaged by washing or heavy filling in of silt and rock. In the La Cresente area, where the greatest damage centered, many acres of vineyard and some orchards were washed so badly as to be ruined agriculturally. Near Puente some truck crops and citrus were damaged by washing and deposits. Near La Habra some damage was done to terraced orchards of citrus and avocados, terraces being badly washed and some trees lost. \* \* \* The total rainfall for the storm was given at an excess of 8 inches in Los Angeles, but the gauge at this station registered 14.91 inches, more than 9 inches being recorded Sunday night. \* \* \* It is of interest to note that the heavy damage and loss of life in La Cresente, Montrose, and Glendale was very largely due to the excessive run-off from the mountain areas that have recently been denuded by fire."

Internal parasites of the beet leafhopper not abundant last summer in Idaho.--C. F. Henderson, of Twin Falls, Idaho, reports that a large number of dissections of Eutettix tenellus were made during the past 3 months to determine the percentage of internal parasitization in the breeding areas of southern Idaho. The dissected material included representative collections taken in 1932 and 1933 and indicated that the percentage of parasitization was very low for both years, being considerably reduced over 1931, when the average internal parasitization was approximately 20 percent. The principal factors responsible for the low degree of parasitization during the past 2 years were, undoubtedly, a small initial population and the low host density throughout the spring and summer.

Derris continues to be effective in cabbage worm control.--  
In a summary of results obtained to date in the control of pests on fall cabbage, W. J. Reid, Charleston, S. C., states that derris root powder continued to prove toxic to the species of cabbage worms present, which include loopers (Autographa brassicae Riley), common cabbage worms (Ascia rapae L.), and diamond-back moths (Plutella maculipennis Curt.). The degree of control obtained with derris powder was proportionate to the strength of material used. Best results (not considering costs) followed the use of a mixture containing 1.5 percent rotenone, that being the strongest dilution tested this season and the weakest used last season. An increase in this concentration to as high as 3.4 percent last year did not apparently increase the kill. A mixture containing only 0.1 percent rotenone showed some toxicity.



New Tarsonemus mites found as pests of economic plants.--F. F. Smith, of the greenhouse-insects laboratory, Washington, D. C., states: "A survey of greenhouse and certain field plants in Pennsylvania, Maryland, Virginia, and the District of Columbia was made at intervals during the past 3 months for the study of the cyclamen mite (T. pallidus Bks.) and the broad mite (T. latus Bks.). Three undescribed species and apparently two varieties were found associated with the two previously studied mites on the same hosts, or they occurred alone. Three additional new species were found on strawberry or black raspberry supposedly infested with T. pallidus. H. E. Ewing is working up the taxonomy of this material. Of interest is the occurrence of five recognized species and one or two varieties on chrysanthemum and strawberry. Other hosts have fewer species."

Mites vary in resistance to hot-water treatment.--Dr. Smith further reports that "In tests with hot water at 110° F., the standard 15-minute immersion killed T. latus and T. pallidus on chrysanthemums, but the three new species #1, #3, "X", and the two variants of "X" referred to above were unaffected. Only 70 percent were killed by a 25-minute immersion and 95 percent by a 30-minute treatment. On the basis of these studies, the hot-water treatment, in order to kill these species, will have to be extended for a longer period."

Oviposition of Drosophila on tomatoes.--Considerable difficulty has been experienced by tomato canners because of infestation of the tomatoes by Drosophila melanogaster Meig., the vinegar fly. R. H. Nelson, Washington, D. C., makes the following comments regarding the oviposition of this fly: "It was found that these flies will oviposit on the following types of tomatoes:

- (1) Red, ripe, skin unbroken, fresh pulp from another tomato placed on the outside. Eggs are deposited in this pulp.
- (2) Green, otherwise as (1).
- (3) Red, ripe, cut made in side to pulp cavity. Eggs deposited in the cut.
- (4) Partly ripe, yellowish to pink, otherwise as (3).
- (5) Green, otherwise as (3).
- (6) Half ripe, pink, solid fruit, freshly cut in half. Eggs deposited on cut surface.
- (7) Red, ripe. Shallow V-shaped cut made into flesh just below skin. Eggs deposited in this slit if the fruit is exposed to the flies before the cut has time to harden over.
- (8) Overripe, skin broken, or beginning to decay and skin broken. Eggs deposited in places where the flesh is exposed.



"They did not oviposit on the following types:

- (1) Red, ripe, solid, no skin broken.
- (2) Red, ripe, bruised spots but skin unbroken.
- (3) Partly ripe, bruised spots but skin entire.
- (4) Overripe, somewhat softened, with bruised spots but skin unbroken.

"In short, it appears that the presence of tomato juice or pulp on the outside of the fruit is necessary before oviposition will take place; and if this is present the flies will oviposit, regardless of the condition of the tomato. Drosophila repleta Woll., however, has been reared only from badly decayed fruit and the adults in cages have refused to oviposit on fresh tomato pulp. This species seems to be a scavenger."

#### FOREST INSECTS

The gipsy and brown-tail moths and cold weather.--C. W. Collins, of the Melrose Highlands, Mass., field laboratory, reports that the unusually cold weather that prevailed in New England from December 28 to December 30, inclusive, was undoubtedly fatal to eggs of the gipsy moth (Porthetria dispar L.) in sections of the infested territory where they were in exposed situations, unprotected by snow, ice, or other material. There probably was also some mortality in the case of the small brown-tail moth (Nygmia phaeorrhoea Don.) caterpillars in their winter webs. J. N. Summers, Greenfield, Mass., has stated (in U. S. Dept. Agr. Bull. 1080) that an exposure of between -20° and -25° F. is necessary to kill entire egg clusters of the gipsy moth, although some eggs in each cluster may be killed by an exposure to -15°. Other records of experiments and observations on file at the Melrose Highlands, Mass., field laboratory indicate that the caterpillars of the brown-tail moth in their winter nests can withstand slightly lower temperatures than can gipsy moth eggs. Records furnished by the Boston office of the Weather Bureau show that temperatures of -20° F. and below occurred in December at certain points throughout the territory generally infested by the two insects and the station has made collections from which it will later be possible to determine to what extent they were killed by the cold spell.

Increased efficiency of a parasitic fly.--The Melrose Highlands, Mass., field laboratory has collected cocoons of the oriental moth (Cnidocampa flavescens Walk.) at points in Boston and vicinity where the tachinid fly Chaetexorista javana B. & B., imported from Japan, was liberated in 1929 and 1930. The overwintering larvae contained in the cocoons have been examined by R. T. Webber to ascertain what



percentage contained maggots of the fly. Mr. Webber found that 63.53 percent of the 2,262 larvae collected at 12 points were parasitized. The percentages of parasitization for the preceding 4 years, based on similar collections, have been 0.78, 8.57, 16.49, and 52.43, respectively.

Death of A. B. Proper.---Argyle B. Proper, of the Melrose Highlands laboratory, died on December 16, 1933, after being ill for about a week with pneumonia. He had been connected with the laboratory since his appointment as Junior Entomologist, July 1, 1927. Mr. Proper was born in Sunapee, N. H., on March 4, 1905. He received his Bachelor of Science degree from the University of New Hampshire in 1926 and his Master of Science degree from the same institution the following year, having majored in entomology. Although Mr. Proper had published but one entomological article, another of his manuscripts had been accepted for publication and he was to have presented a paper at the 1933 meeting of the Entomological Society of America at Boston, Mass. At the time of his death he was preparing two other manuscripts. These and the papers he had completed had to do directly or indirectly with forest and shade-tree insects.

Meeting of western forest entomologists.---Meeting for the first time in a period of several years, the forest entomologists of the three far western stations gathered at Portland, Oreg., on December 11 to 13 for a 3-day conference on entomological problems of mutual interest. Those present were J. M. Miller and K. A. Salman from the Berkeley, Calif., laboratory; J. C. Evenden, A. L. Gibson, and W. D. Bedard from the Coeur d'Alene, Idaho, laboratory; and F. P. Keen, J. A. Beal, W. J. Buckhorn, and J. M. Whiteside, of the Portland laboratory. Problems relating to the winter kill of bark beetles during periods of extremely low temperatures received special consideration. The operation of natural control factors and the improvements in methods of applied control for forest insects also were made the subject of round-table discussions.

C. W. A. aids forest research program.---F. P. Keen, of the Portland, Oreg., field laboratory, reports that through cooperation with the Forest Experiment Station, three C. W. A. workers were added to the staff early in December to assist with clerical and other duties. These workers include a clerk-typist for routine office duties; a draftsman-photographer to help in preparing maps, charts, and photographs for use in reports; and an experienced technical artist-preparator capable of mounting insects and preparing exhibits and plates for illustration. This extra help will be available as long as the C. W. A. program is continued and should prove of great value in bringing up to date and advancing the work at this station.



The protection of fire-killed Douglas fir.---J. M. Whiteside, of the Portland laboratory, reports that an attempt has been made to thwart the attacks of insects in Douglas fir recently fatally scorched by fire. Using a powerful poison solution, with a dye to indicate its path through the tissues, the first of a series of tree-injection tests have been made to determine whether it will be possible to protect fire-killed timber from the ravages of insects until logging operations can salvage these valuable logs. At the present time, the solutions have not ascended to any great height owing to the dormant condition of the trees. It is probable that the trees will take up the solutions slowly during the winter and more rapidly in the early spring, when it is hoped that sufficient protection will be afforded to repel the attacks of insects. W. D. Bedard, Coeur d'Alene, Idaho, spent several days in December at the Portland laboratory, assisting in the medication of fire-scorched trees in an effort to preserve the wood from deterioration. The same injection technique used to medicate western white pine was applied to the fire-scorched trees, and but few modifications were necessary.

Bark-beetle parasites and control.---Mr. Bedard has recently completed a preliminary report concerning the relation of parasites and predators to the control of the mountain pine beetle (Dendroctonus monticolae Hopk.) in western white pine. This report points out that although artificial control can reduce the bark-beetle population in a given area, the numbers of beneficial insects are reduced proportionately. Therefore, when control has been completed, the intensity of the infestation has been reduced, but the potential of future increase remains the same. If the natural enemies of the bark beetles can be preserved during control, however, while the bark beetles are destroyed, it may be possible through increased parasitization to reduce the potential increase of the infestation. The report describes criteria whereby trees containing a high percentage of parasites can be recognized by men marking the trees for treatment, thus enabling them to leave such trees untreated.

Vectors of Dutch elm disease.---In connection with the work upon insect vectors of the Dutch elm disease, carried on by special research funds made available by E. C. W. and in cooperation with the New Jersey Agricultural Experiment Station, a number of elm trees are now in full leafage and growing as in early summer. This condition has been brought about through the cooperation of Dr. Denny of the Boyce Thompson Institute, Yonkers, N. Y., who by treatments with certain gases succeeded in the difficult task of breaking the dormancy of the trees in midwinter. Various beetles considered as probable or possible vectors of the disease are also starting to emerge in considerable numbers from logs infested by the Dutch elm disease. W. D. Buchanan, conducting the laboratory work on insect vectors, hopes to get earlier information as to what insects are culpable than



could be obtained by awaiting the natural seasonal sequence. The insects now available for experimentation include the smaller European elm bark beetle (Scolytus multistriatus Marsh.), the elm snout beetle (Magdalis barbata Say), and the elm borer (Saperda tridentata Oliv.).

#### CEREAL AND FORAGE INSECTS

P. N. Annand has been appointed as principal entomologist in charge of the Division of Cereal and Forage Insects, effective January 16. At that time W. H. Larrimer was transferred to Arlington Farms, Va., where he will be in charge of the cereal and forage insect work carried on by this Bureau's laboratory located there.

Influence of planting date on rate of larval survival in European corn borer.--Reporting work done by L. H. Patch, B. A. App, G. T. Bottger, C. A. Crooks, and F. L. Simanton, D. J. Caffrey, Toledo, Ohio, says that the percentage of plants exposing their tassels near the time when corn borer eggs placed on the plants were hatching has been found to be closely associated with the differences in the survival of the borer on different strains of corn planted on the same date. To determine whether the same association occurred when these strains were planted on different dates, the data from 24 strains planted on May 19 and June 2, 1933, were rearranged in order to facilitate the study. The object of the study was more specifically to determine whether an interval of time between the appearance of the tassels of a group of strains planted on one date, and another group of strains planted on a different date, would be as closely associated with the survival of the borer as though the same interval had occurred between the appearance of the tassels of two groups of strains planted on the same date. For this purpose the strains of the two plantings were so grouped that the mean tasseling date of Group 2 was 4 days later than the mean tasseling date of Group 1, both groups being planted on May 19, that the mean tasseling date of Group 4 was 4 days later than the mean tasseling date of Group 3, both of these groups being planted on June 2, and that the mean tasseling date of Group 3 was 4 days later than the tasseling date of Group 2, Group 3 being planted on the later date and Group 2 on the earlier date. Group 2 was composed of the 10 strains of the May 19 planting which tasseled latest; Group 1 was the 10 strains next preceding Group 2 in tasseling; Group 4 was the 8 strains of the June 2 planting which tasseled latest; and Group 3 was composed of the 13 strains next preceding Group 4 in tasseling. The mean tasseling dates, the percentage of the plants showing tassels on July 23, the mean percentage of survival of the borer on the groups, and the ratios between the borer survival on the groups, in the studies of 1933, are as follows:



| Group | Plant-<br>ing<br>date | Mean<br>tassel-<br>ing<br>date<br>(July) | Plants<br>showing<br>tassels<br>July 23<br>(mean %) | Borer<br>survival<br>(mean %) | Ratios between borer<br>survivals |                   |                   |
|-------|-----------------------|--|---|-------------------------------|-----------------------------------|-------------------|-------------------|
|       |                       |  |   |                               | Groups<br>1 and 2                 | Groups<br>3 and 4 | Groups<br>2 and 3 |
| 1     | May 19                | 17.25                                    | 94.8  | 12.35                         | 1.20                              | --                | --                |
| 2     | May 19                | 21.45                                    | 66.7  | 10.30                         | --                                | --                | 1.33              |
| 3     | June 2                | 25.30                                    | 29.2  | 7.75                          | --                                | 1.21              | --                |
| 4     | June 2                | 29.50                                    | 2.7   | 6.41                          | --                                | --                | --                |

The borer survival on the group of strains tasseling 4 days earlier within each planting date was 1.20 and 1.21 times as great as the survival on the group tasseling latest, whereas the borer survival on the group of strains of the May 19 planting which tasseled 4 days earlier than the earliest tasseling group of the June 2 planting was 1.33 times as great as the survival on the group planted June 2. The slightly greater level of borer survival on the May 19 planting, when compared with the emergence of the tassels, is probably accounted for by the greater leaf area of the plants, which affords greater opportunity for the young borers to find new locations on the plants when blown off by the wind. The difference between 1.330 and 1.205 is possibly accounted for in this manner. Also, it is noted that the percentage of plants showing tassels on July 23 in the different groups is, roughly, as 1 is to 30, 60, and 90. It appears from the study of this one year that the reason for the decrease in the survival of the borer on corn planted later as compared with corn planted earlier, is apparently the same as the explanation for the difference in the borer survival between different strains of corn planted on the same date, and that the availability of the tassels is associated closely with the differences in the survival of the corn borer.

Corn borer control tests with low-cutter harvester-shredder combine.--M. Schlosberg and R. T. Everly, Toledo, report that in connection with the experimental development of a machine designed to combine the operations of low cutting of the corn plants, harvesting of the ears, and shredding of the stalks in one operation, following preliminary trials in 1932, tests were made during 1933 to determine the efficiency and control value of the machine for different corn borer populations harbored in the plants. The machine is being developed by the Bureau of Agricultural Engineering, and the project cooperatively conducted with the same bureau on the U. S. Department of Agriculture Experiment Farm, near Maumee, Ohio. Approximately 20 acres of corn were harvested by the machine on the U. S. Department of Agriculture experiment farm, near Maumee, Ohio, in November 1933,



with as much facility and as good results as were obtained by ordinary mechanical pickers under ordinary conditions, and with much better results in borer control. The major part of the corn comprised hybrids of large size and rigid stalk development. The results clearly demonstrate the practical value of the machine, although still in the experimental stage of development, especially with reference to the preparation for small grains of cornfields with the stalks standing, where plowing is not practiced. Where plowing is a part of the treatment of the soil it is evident that the resultant cleaner operation possible would leave little or no debris for the reestablishment of migrant borers returning to the surface, as when whole stalks are turned under, disked, or otherwise treated, without attempting a clean operation.

Immunity and resistance of certain alfalfa plants to pea aphid.--- R. A. Blanchard, Sacramento, Calif., reports that 49 alfalfa plants, grown from self-fertilized seed from 5 plants that showed immunity to pea aphid (Illinoia pisi Kalt.) damage under field conditions, were tested for immunity or resistance to aphid attack in outdoor cages: 29 of the plants showed apparent immunity, 8 apparent resistance, and 12 susceptibility. Of 17 check plants, 15 were susceptible and 2 showed some resistance. The 2 resistant plants failed to grow normally in the cages. Of 7 seedlings from plants showing immunity to I. pisi under Wisconsin conditions (seed supplied by John E. Dudley, Jr.), 4 showed immunity, and 3 apparent resistance, under California conditions. Both series of cages suggest that the plants are heterozygous, and further self-fertilization will be necessary in order to obtain pure-line seed. Aphids were unable to live for more than 5 days on the immune plants. They became dark green and shrunken after being on the plants for a day or so, and repeatedly deserted the plants. Shortly after death, the aphids became light green in color and gradually turned brown after a day or so. The dead aphids were almost always found near the edges of the cage, showing that they were attempting to migrate from the plants when death overtook them. No new-born nymphs reached maturity on the immune plants, although occasionally an adult produced nymphs upon them. On plants considered resistant, only a very small proportion of new-born nymphs reached maturity, and the adults gave birth to not more than 12 nymphs per female. On the check plants the average was 68 nymphs per female.

Farm practices to decrease grasshopper infestations in Sacramento Valley.---C. C. Wilson, Sacramento, reports that some 450 acres



of alfalfa that were infested by grasshoppers in 1933 are in the process of cultivation--some being plowed and some disked. It is believed that the eggs of grasshoppers contained in this land will be destroyed by such cultivation, decreasing the infestation in 1934. The infested area near Sacramento is now approximately 200 acres.

Tomato fields a source of corn ear worm.--W. B. Cartwright reports that during the fall months large commercial tomato fields at Sacramento carried an infestation of corn ear worms. When frost occurred the mature larvae entered the ground and pupated. This source of infestation, together with alfalfa fields, is suspected of giving rise to the brood of adults that appear here in April and May.

Lesser corn stalk borer attacks string beans and lespedeza.--Geo. W. Barber, Savannah, Ga., reports that during the summer and fall of 1933 injurious infestations and apparently new habits of Elasmopalpus lignosellus Zell. were observed. In the vicinity of Savannah the larvae destroyed successive plantings of string beans from about June 23 until August 15. In this case the larvae assumed a distinctive boring habit. Entering the stalks of the young plants where they bore from two to four leaves, the larvae bored upward and downward, hollowing out the stalk and killing the plants. In the case of larger plants with harder stems they fed, protected by a web, at or a little below the surface of the soil, girdling the plants. The second instance of outbreak by this insect occurred in Washington County, Ga., where it was found seriously injuring the forage plant Lespedeza sericea. This apparently was a new food-plant record for this insect. At the time of observation, September, the stalks of this plant were quite woody. The larvae lay in webs just below the surface of the soil and fed completely around each stalk, girdling and destroying the plants. The plants first gave evidence of attack by showing yellow foliage. Feeding had apparently occurred throughout the summer, causing a progressive thinning of the planting, until at the time of observation about 25 percent of the stand had been destroyed. These observations suggested that this insect might become an important enemy of lespedeza, and might present a difficult problem in control.



## COTTON INSECTS

Push-type cottonstalk shaver.--D. A. Isler, of the Bureau of Agricultural Engineering, cooperating in the pink bollworm investigations at Presidio, Tex., has developed a push-type cottonstalk shaver for use with a tractor in cleaning cotton fields. Concerning this invention he reports: "Several objections to the use of a sled-type cornstalk shaver in the Presidio Valley for cutting cotton stalks at ground surface preparatory to raking suggested the idea of pushing the implement in front of a tractor. The tallest stalks in the valley attain heights of 5 to 7 feet and branch out profusely into the row middles, so that in some fields it was sometimes difficult to see just where the rows were. The butts of the largest stalks in one field measured 2 inches in diameter. Use of the ordinary sled-type shaver resulted in the shattering of many bolls from the plants and in the breaking of branches by the horse and singletree in front of the shaver. It was also difficult to keep the sled operating evenly halfway between the rows, because of the pressure of the heavy stalks on the cutting blades. As the soil was sandy, especially where the plant growth was rank, two rolling colters at the rear of the pull-type sled were not always sufficient to hold the sled steady. Some advantages of the push-type shaver over the pull-type sled were: The lessening of boll shattering, due to elimination of the horse and singletree in front of the shaver; greater stability of the outfit; windrowing of stalks by the shields; and increased operating speed. Usefulness and versatility of the shaver may be increased by providing for an adjustable width. Adaptability of the push-type shaver for use with horses is also contemplated. Changes in construction may result in a better adaptation of the present pull-type shaver for use in cottonstalks."

Field tests have shown that under favorable conditions, the stalk shaver will cut 100 percent of the stalks where cotton is cultivated level and  $99\frac{1}{2}$  percent in listed cotton, although 8 percent of the stalks were left with attached lower branches in listed cotton. In shatterage tests to determine the quantity of cotton forms knocked off the plant, it was found that the stalk shaver shattered more forms than did a machete carefully used by one man. In field practice, however, where machetes had been used by a group of laborers and the stalk shaver operated by a trained man, there was no difference in shatterage between the two methods of stalk cutting. A severe test conducted in a field where there was an excess of fruiting forms on the plants showed that the tractor and stalk shaver did not bury fruiting forms in the soil.



Longevity of boll weevils.--H. C. Young, Eufaula, Okla., states that boll weevils (Anthonomus grandis Boh.) that emerged from the hibernation cages in the spring of 1933 were placed in glass tumblers and fed on cotton seedlings until cotton squares became general in the fields; then they were fed on squares. Twenty-two weevils emerged from the cages and complete longevity records were obtained for 21 of them. All of these emerged from the hibernation cages between May 9 and June 9. Their average longevity after emergence was 52.67 days. Four were alive on September 3 and one lived until September 15. This last weevil was collected prior to November 1, 1932; and emerged from hibernation on June 9, 1933; was in the hibernation cage for 221 days, during which time it had no food; and lived 98 days on food after emerging--a total longevity of 319 days. The average longevity after emergence for weevils hibernated in prairie hay was 51.25 days; for those hibernated in cornstalks, 28.67 days; and for those hibernated in leaves, 67.50 days. During May and June a number of overwintered weevils were collected in the field. They were placed in glass tumblers and fed in the same way as were those that emerged from the hibernation cages. The average longevity for the field-collected, overwintered weevils was 49.43 days. The maximum longevity was 118 days for one weevil that was collected on June 8 and died on October 2. The average longevity for first-generation, field-bred weevils given similar treatment was 72.14 days. The maximum record was for a weevil that emerged on June 27 and lived until December 1, or 157 days.

Boll weevil control tests at Tallulah, La., in 1933.--M. T. Young has submitted a report on the field-plat tests for boll weevil control conducted at Tallulah during 1933. Results from the use of sodium fluosilicate, sodium fluoaluminate, barium fluosilicate, wet and dry mixtures of paris green and calcium arsenate, mixtures of copper arsenite and calcium arsenate, and calcium arsenate mixed with lime were compared with results from the standard calcium arsenate method of boll weevil control and on untreated checks. The effectiveness of calcium arsenate applied, at the time of cultivation, with a duster attached to the cultivator was also tested. In order to make as many tests as possible with reduced personnel the number of calcium arsenate and check plats was decreased. Instead of the usual 3-plat test with a standard calcium arsenate and a check for each plat dusted with the material to be tested, the tests were laid out with 4 to 7 plats each, depending on the size of the area with uniform conditions. Forty 1-acre plats were used, so arranged that results from each material could be compared with those from a calcium arsenate and a check plat. The results are summarized as follows:



The square-infestation records showed that sodium fluosilicate, sodium fluoaluminate, and barium fluosilicate were not so effective as calcium arsenate when applied at the same rate per acre. Sodium fluosilicate, when applied at the rate of 8 to 12 pounds per acre (per application), was more effective in controlling the percentage of square infestation than when applied at the rate of 4 to 6 pounds per acre (per application). With 7 effective applications at 8 to 12 pounds per acre the plats yielded 8.9 percent and at 4 to 6 pounds they yielded 20.5 percent less seed cotton than the untreated check, while calcium arsenate gave an increased yield of 36 percent over the check. Light to serious burning of the cotton foliage was caused by most of the sodium fluosilicate applications. Sodium fluoaluminate gave a decreased yield of 1.4 percent and barium fluosilicate gave an increased yield of 3.9 percent, as compared with 36 percent increased yield from the calcium arsenate in the same test.

The wet and dry 75 percent calcium arsenate and 25 percent paris green, of brands both A and B, were equally or more effective in controlling the weevil than was calcium arsenate and in some tests gave increased yields greater than were given by calcium arsenate alone. The comparative yields in the plats treated with the wet and dry mixtures indicate that there is little difference in their effectiveness. Burning of the cotton foliage was produced by many of the applications of both the wet and dry mixtures of Brands A and B. The two mixtures of 20 and 25 percent copper arsenate with 80 and 75 percent calcium arsenate gave results about equal to those of the wet and dry mixed paris green and calcium arsenate. The hydrated lime and calcium arsenate mixed 1-1 and 2-1 gave very good weevil control, based on the square infestation records, but the increase in yield for the one test of each mixture was not so great as for the plat treated with calcium arsenate alone. Although there was considerable variation in the increased yields of the three cultivator-dusted plats, when averaged, they gave rather promising results. The nine plats given the standard calcium arsenate treatment gave an average increase of 419 pounds of seed cotton per acre, or 45.4 percent increase over the eight untreated check plats. These gains ranged from 187 to 617 pounds of seed cotton per acre, or from 28.6 to 72 percent.

Cotton leaf perforator.--T. C. Barber, Brownsville, Tex., reports that during October and November the cotton leaf perforator (Bucculatrix thurberiella Busck) increased slightly in the fields after being almost exterminated in that district because of the defoliation of the cotton plants by the September hurricane. As the cotton foliage increased during December the perforators became more abundant and can now be found in nearly all fields. Fortunately the life-history studies



in the insectary were not seriously affected by the hurricane. Cooler weather during October and November retarded development, so a period of 31 to 40 days was required for a generation, as compared with 13 to 17 days in midsummer. Moths from the 13th generation have emerged and it is expected that at least 15 generations will be produced during the 12-months' period. The following summary gives the average period of development for each stage by months.

Average monthly development period of B. thurberiella  
at Brownsville, Tex., 1933

| Month       | : Average<br>: incubation<br>: period | : Average<br>: larval<br>: period 1 | : Average<br>: pupal<br>: period 2 | : Average period from<br>: egg to moth |
|-------------|---------------------------------------|-------------------------------------|------------------------------------|--|
|             |                                       | <u>Days</u>                         | <u>Days</u>                        | <u>Days</u>                            |
| May.....    | 3.9                                   | 8.7                                 | 7.0                                | 19.6                                   |
| June.....   | 4.0                                   | 7.4                                 | 6.6                                | 18.0                                   |
| July.....   | 3.3                                   | 7.0                                 | 6.5                                | 16.8                                   |
| August..... | 3.8                                   | 8.0                                 | 6.6                                | 18.4                                   |
| September.. | 3.8                                   | 7.9                                 | 6.9                                | 18.6                                   |
| October.... | 4.6                                   | 10.2                                | 8.5                                | 23.3                                   |
| November... | 7.1                                   | 13.0                                | 11.3                               | 31.4                                   |
| Season...   | 4.2                                   | 8.4                                 | 7.3                                | 18.9                                   |

<sup>1</sup> From 4,137 records.

<sup>2</sup> From 3,914 records.

Croton clean-up for cotton flea hopper control.--K. P. Ewing, Port Lavaca, Tex., reports that good progress was made in December on the Calhoun County Croton Weed Destruction Project, a C.W.A. project supervised by Mr. Ewing and assistants, for the control of Psallus seriatus Reut. Very little time was lost on account of bad weather and rains and the full quota of 100 men assigned to the work were available most of the month. The following table gives a summary of the acreage destroyed in the different sections of the county.

Acreage of croton destroyed from December 7 to 30, inclusive, 1933

| Location         | : Hand-picked |            |       | : Mowed |            |       | : Grand |
|------------------|---------------|------------|-------|---------|------------|-------|---------|
|                  | : Ranch       | Cultivated | Total | : Ranch | Cultivated | Total | : total |
| Olivia.....      | 100           | 703        | 803   | 279     | 279        | 558   | 1,361   |
| Green Lake       |               |            |       |         |            |       |         |
| and Sweetwater.. |               | 745        | 745   |         |            |       | 745     |
| Seadrift and     |               |            |       |         |            |       |         |
| Long Mott.....   | 619           | 806        | 1,425 | 442     | 154        | 596   | 2,021   |
| Total.....       | 719           | 2,254      | 2,973 | 721     | 433        | 1,154 | 4,127   |

Almost half the area to be cleaned has been finished and it is hoped that the work may be completed by February 1.

Cotton flea hopper at Brownsville, Tex.--T. C. Barber reports that cotton flea hoppers were collected during November 1933 from only one species of plant, Tidestromia lanuginosa, which has been recognized for several years as the local winter host plant. The numbers on this plant steadily decreased as the month progressed. No nymphs were collected after November 3.

Biological notes on field crickets.--J. W. Folsom and assistants, Tallulah, La., have completed their life-history studies of the field cricket (Gryllus assimilis Fab. var. pennsylvanicus Burm.), which sometimes causes serious damage to young cotton plants in times of drought. There are two generations a year at Tallulah. The crickets hibernate as half-grown nymphs, which reach maturity in April and May. Adults of the new generation appear from July 15 to early in September and most have died off by October 15. The maximum number of eggs laid by a female was 808, and the average number about 300. The maximum egg period was 21 days (in May) and the minimum was 9 days (in July). It was difficult to determine the molts until P. A. Woke devised a method of marking the pronotum of the nymph with a spot of aluminum paint. The number of instars ranged from 9 to 12, with an average of 10, depending on the mean temperature. The cooler it is, the longer the period of nymphal development and the greater the number of molts. The instars are distinguishable by differences in measurements, coloration, number of hind tibial spines, and number of antennal segments.

| Instar       | : Hind tibial spines : |        | Antennal segments |
|--------------|------------------------|--------|-------------------|
|              | Outer                  | Inner  |                   |
|              | Number                 | Number | Number            |
| First.....   | 0                      | 0      | 31-36             |
| Second.....  | 2                      | 3      | 46-49             |
| Third.....   | 3                      | 3      | 53-59             |
| Fourth.....  | 5                      | 4 (5)  | 64-78             |
| Fifth.....   | 6                      | 5      | 79-86             |
| Sixth.....   | 6                      | 5 (6)  | 98-113 (101-104)  |
| Seventh..... | 7 (6)                  | 6      | 103-145 (126-145) |
| Eighth.....  | 7                      | 6      | 148-177           |
| Ninth.....   | 7                      | 6      | 153-196           |
| Tenth.....   | 7                      | 6      | 164-213           |

When there are 9, 11, or 12 nymphal instars, these are like the normal tenth instar in their characters. In the ninth instar the wing pads appear, and extend to the first abdominal segment. In the tenth instar they extend to the third abdominal segment, and the venation has become evident. The ovipositor appears in the seventh instar, but shows no change in the eighth. In the ninth instar the ovipositor is longer, however, extending slightly beyond the abdomen. In the tenth instar it exceeds the abdomen by two thirds its own length.



## INSECTS AFFECTING MAN AND ANIMALS

Destruction of eggs of horse botfly.--E. F. Knipling of the Ames, Iowa, field laboratory, who has found that the eggs of Gastrophilus intestinalis De G. are very resistant to destruction by chemicals, has devised a method of decoying the larva from the egg by an artificial stimulus, after which it is more readily killed. The larva, ready to emerge, ordinarily remains within the egg upon the hair of the horse until external conditions are favorable for emergence; and it is during this stage that they are especially difficult to destroy. Mr. Knipling has used the simple expedient of dashing warm water on the coat of the horse and has found this to be effective in inducing emergence of the larva from the egg. A gradual rise in temperature does not bring about the response, however; the temperature rise up to about 113° F. must be rapid to be effective.

Use of aquatic saw aids in control of *Mansonia* larvae.--T. E. McNeel, of the Orlando, Fla., laboratory, has used a Ziemsen aquatic saw to cut down Pontederia plants in a pond having an infestation of larvae of M. perturbans Wlk. The plants were cut about 10 inches below the water surface, and successful results were obtained both in the elimination of the larvae and in the destruction of the plant growth. Eight additional cuttings over small areas have since been made with similar results.

The existence of an unsuspected new species of screwworm.--E. C. Cushing, Menard, Tex., has returned from a 3-months' stay at the Liverpool School of Tropical Diseases in England. With the cooperation of Dr. W. S. Patton of that institution, Mr. Cushing, who has been making a microscopical study of the terminalia of specimens considered to be Cochliomyia macellaria Fab., has found among material collected in Texas the new species americana Cushing and Patton. Owing to the fact that adults of the latter species were never found in traps, while macellaria is commonly caught in that way, the possibility is opened up that americana is not attracted by fetid odors--a typical characteristic of macellaria. Mr. Cushing is of the opinion that macellaria does not produce myiasis and that americana is the true screwworm of the Western Hemisphere. This will necessitate a reinvestigation of the biology, habits, and distribution of the two forms. Perhaps it may also require modification of control recommendations.

Pest mosquito control work in cooperation with the C. W. A.--The work of getting under way this large-scale mosquito control project has required the combined efforts of practically the entire Washington office force, which has been doubled by additional temporary employees provided by C. W. A. funds. In the 32 States and the District of Col-

umbia in which work is now going on the program has progressed in varying degrees of intensity. Various setbacks have occurred, owing to the difficulties incident to the rapid organization of the work over so wide a field and, in many cases, to faulty coordination between the functions of the newly appointed field force and those of field representatives of the Civil Works Administration. These difficulties are gradually being ironed out, however, and real progress is being made. On January 12 a total of 18,865 men were at work on this project.

Tick control work.--Work financed by funds allotted by the Civil Works Administration is under way in certain localities in Maryland, Virginia, Delaware, and the District of Columbia. In general this work is more or less experimental and has been inaugurated only in areas where human cases of Rocky Mountain spotted fever have occurred. It consists essentially of the destruction and clean-up of undergrowth, weeds, etc., which harbor the rodent hosts of ticks. Some surprising information of a scientific nature is being obtained; for example, ticks have been found attached to rodents in midwinter. On January 12 a total of 369 men were at work on this project.

Field insectaries provided by Public Works Administration.--At the Sonora, Tex., field laboratory two insectaries, one a combined insectary and animal house, have been erected under an allotment of funds from the P. W. A. in order to facilitate the work on control of insects affecting sheep and goats. Fencing has also been provided for several outdoor pens for animals.

#### HOUSEHOLD AND STORED PRODUCT INSECTS

On December 7 the Kansas City, Mo., organization of Cereal Chemists of the Southwest District met for luncheon at the La Salle Hotel with G. B. Wagner as a guest. After luncheon the entire group adjourned to the laboratory of the Bureau, where Mr. Wagner had arranged a display of insects affecting grain and flour products, together with typical types of injury caused by the various species involved and photographs of control measures commonly practiced. Two and one half hours was spent in the examination of the display and in informal discussion of present problems of elevator and mill. The following firms were represented: Commander Larabee Mills, Ismert Hinche Milling Company, Southwestern Milling Company, Washburn Crosby Milling Company, Flour Mills of America, Midland Milling Company, Rodney Milling Company, Wagner Gates Milling Company, Manor Baking Company, Loose Wiles Biscuit Company, and Wallace Tierney Corporation.



Raisin moth catches, 1931-33.--D. F. Barnes of the dried fruit insect investigations, Fresno, Calif., reports: "A comparison of the catches of Ephestia figulilella Greg. for the three seasons in the Muscat vineyard and in a Black Mission orchard during comparable periods trapped each year shows a decrease in the Muscat vineyard of 33.9 percent, compared with 1931, but an increase of 73.9 percent, compared with 1932. Similar decreases and increases were recorded from the Black Mission fig orchard. Careful sorting of the records indicates that this excess in 1933 over 1932 occurred late in the season with moths whose progeny will make up the overwintering brood. The quantity of figs which matured late in the season was large this fall; the weather was favorable for larval development to December 14; hence it seems reasonable to expect a heavy spring emergence from the fig orchards of the district. The information obtained during the past year concerning hibernation in the soil and infestation in early fruit makes it possible to interpret more accurately than in previous years, graphs prepared from data on the average catch per day. This year there appeared to be two distinct peaks of spring emergence, each of which carries on throughout the season. The first of these occurred from May 19 to 30 and probably represented larvae emerging from beneath the bark while the second occurred from June 23 to 30 and represented larvae overwintering in the soil. The progeny of the first group appeared as adults from July 28 to August 8 and again from October 6 to 13, but the adults from the second group reached a peak from September 1 to 15. The first group had practically 3 complete generations in 1933, while the second produced 2 and a partial third. The developmental period was approximately 70 days between the broods. In 1931 the developmental period appeared to range from 49 to 55 days and in 1932 from 49 to 59 days. It appears from the records that in 1931 there were 4 complete generations, in 1932 three and a partial fourth, and in 1933 two groups, one with three and one with two and a partial third generation. The percentage of females among the adults taken was 42.25."

Indian-meal moth in stored raisins.--Mr. Barnes also reports that by December 18 Ephestia larvae seeking hibernation had practically ceased to crawl. "At a plant where raisins of the 1932 crop were stored, the fruit was heavily infested with Plodia interpunctella Hbn. The fruit was piled in bins about 5 feet deep. Picking boxes filled with fruit had been used to make bin walls in an open storage. The fruit in the bins had settled so that at least one tier of boxes was above the fruit. The writer collected 1,200 to 1,500 Plodia larvae from between the ends of the exposed boxes in about 2 hours. This is the heaviest Plodia infestation observed since I began making raisin-storage observations in 1930."

Trap catches of cigarette beetles.--W. D. Reed, of the cured tobacco insect investigations at Richmond, Va., reports that during the past season a tabulation of catches of 10 traps operated from May 15 to October 30 in 2,610,000 cubic feet of Turkish tobacco storage, and of 19 traps operated from June 1 to October 31 in 3,393,000 cubic feet of domestic flue-cured tobacco storage, shows that over 28 million cigarette beetles (Lasioderma serricornis Fab.) were captured. Over 420 million beetles were captured in the trapping work at Winston-Salem and Richmond combined. Large as these catches are, it has not yet been determined in what practical way the elimination of so many adults affects the value of the tobacco. Perhaps the answer is indicated by the recent installation by one company of a large vacuum plant for fumigating its stocks.

Two-season survival of pea weevil.--Tom Brindley, Moscow, Idaho, submitting much data obtained during the past year on Bruchus pisorum L., states that on November 22, 1933, he removed from a Ponderosa pine a band of 16-mesh screen placed in the fall of 1931 as a cage around the tree near its base. The cage covered an area 1 foot wide and 4 feet in circumference. It had been left undisturbed since placed on the tree and while it had sprung slightly by the growth of the tree in one place which might have permitted a weevil to enter, Mr. Brindley considers it improbable that a weevil did enter, because a thorough search of the bark of the tree revealed no hibernating weevils outside the cage and a half hour of searching revealed only 8 weevils in adjacent trees. In all, 181 dead and 2 living weevils were found in the 4 square feet of bark covered by the cage. This is interesting, not only because it indicates the large number of pea weevils that may hibernate in such a small area of bark, but, if the 2 living weevils had survived two growing seasons, as Mr. Brindley believes likely, it corroborates the data reported in October on similar two-season survivals proved to occur in warehouses.

Developmental period of pea weevil.--A. O. Larson, Corvallis, Oreg., in charge of the pea weevil investigations in Oregon and Idaho, submits interesting data on the varying length of time required by certain pea weevil specimens to reach maturity. He calls special attention to a weevil larva found well grown in a Canadian pea 143 days after the seed was picked in the field. The seed had remained in its pod under conditions favorable for development. The average period for development from egg to adult was found to be about 57 days at Corvallis.

Webbing clothes moth reared on wheat.--Wallace Colman, Takoma Park, Md., reports the very interesting fact that during the past month he has reared Tineola biselliella Hum. on commercial wheat germ which is rich in Vitamin B.



Fumigation against rice weevil in corn.--S. E. McClellendon of Thomasville, Ga., reports that at the request of many farmers inquiring as to the value of benzol as a fumigant, he fumigated several lots of corn during October, but the results were not satisfactory, as adult weevils (Sitophilus oryzae L.) have emerged from fumigated samples. Weevils in all stages were apparently killed in one lot of corn by two successive fumigations and the odor and taste of meal later made from the corn were not affected.

Notes on flour-mill insects.--N. E. Good, in his investigations of flour-mill insects during December, has found several species of rare or little known insects in flour mills and feed stores in and about Washington, D.C. Quite a number of Murmidioides ovalis Beck (family Murmidiidae), a very small, rounded, black beetle seldom found except in vegetable refuse, were taken for rearing purposes from some dry, shelled corn purchased in a local feed store. Two predacious beetles of the family Histeridae, Carcinops 14-striata Steph. and Dendrophilus punctulatus Say, have been found in fairly large numbers in the basements of nearby flour mills in both Maryland and Virginia. These beetles have usually been found associated with the well known beetles Tenebrio molitor L., T. obscurus Fab., Sitophilus granarius L., Palorus ratzeburgi Wissm., and Alphitophagus bifasciatus Say, and it is probable that they aid materially in keeping down the numbers of these pests.

One of the hairy fungus beetles, Mycetophagus bipustulatus Melsh., which superficially appears very much like a large specimen of the two-banded fungus beetle (Alphitophagus bifasciatus Say), has been taken on several occasions in the basements of nearby flour mills in Maryland. This is thought to be the first record of this species from a flour mill.

Another very interesting and unusual beetle, Aglenus brunneus Gyll., of the family Colydiidae, has been taken in a local mill in Virginia and in another in Maryland. Although of no economic importance, this species is interesting in that it is totally blind. In both cases this beetle was found during a casual examination of waste grain lying on dirt floors in dark and musty corners of the basements of the flour mills. This is also thought to be the first record of this species in flour mills.

#### IDENTIFICATION AND CLASSIFICATION OF INSECTS

A. G. Boving reports that in addition to the rare larvae of the water beetle Ancyronyx variegatus Germ., reported on in the December (No. 235) Monthly Letter, the collection has recently received, from the same source, the larvae of five other species of the systemati-

cally important small family Helmidæ. This additional material has enabled Dr. Boving to make a synoptic key to several of the typical species of this family.

Doctor Boving also reports the receipt from J. P. Kryger, of Denmark, of 14 vials of reared Danish coleopterous larvae, most of which represent economic species.

Doctor Boving reports the identification of a larva of Adetus subellipticus Bates, a species previously reported only from Guatemala and Honduras, collected in squash roots at Nogales, Ariz., November 27, 1933, by G. C. Martin (B.P.Q. Nogales No. 3746).

L. L. Buchanan has identified as Euxenodes sp. specimens of a weevil sent in by Prof. J. R. Watson of Gainesville, Fla., November 24, 1933, with a report that they are heavily infesting peppers in Dade County, Fla. No representatives of this tropical and subtropical genus have heretofore been reported from the United States, although there are indications that some related forms infest related plants in Central America.

Luis Martorell of Santurce, P. R., now studying at Ohio State University, came to Washington during Christmas week to obtain identifications of Venezuela insects. In 1932, Mr. Martorell was teaching entomology in a school at Maracay, Venezuela, and at that time made a study of the biologies of the insects of that region. He generously acquiesced in the retention of such specimens as were desired for the National collection.

Foster H. Benjamin believes that he has rediscovered the moth Lasionycta arietis Grote in a lot of specimens sent in for identification by L. P. Rockwood, Forest Grove, Oreg. The species has remained unknown to collections since 1879.

About the first of the year Walter Sweadner of the University of Pittsburgh brought series of slides of genitalia of the genus Platysamia, including slides from hybrids, for consultation and study with Mr. Benjamin. With Mr. Benjamin's aid he also worked over the National Museum collections of this genus and of the butterfly genus Dryas.

Recently Carl Heinrich received from J. C. M. Gardner, of the Forest Research Institute, Dehra Dun, India, several larvae and pupae of Hyblaea puera Cramer. This insect is a teak defoliator and, according to Mr. Gardner, one of the most important forest insects of India. The systematic position of the family Hyblæidæ had been a



matter of dispute for some time, It was formerly placed as a subfamily of the Noctuidae. Recently Dr. Forbes placed it under the Pyraloidea, upon characters of the adult thorax and the pupa. The larvae support his assignment. They are typically pyralid in all structural characters. Upon the sum of its characters (adult, pupal, and larval) the Hyblaeidae must be considered as a distinct family near Pyralidae but not within that family as now defined. Immature stages of Hyblaea are rare in collections and the specimens received from Mr. Gardner are all that we have in the National collection.

In a collection of Tabanidae from A. Earl Pritchard, of the Oklahoma A. and M. College, Alan Stone has identified three examples of Tabanus carolinensis Macq. from Atoka, Okla. This is a western record for the species.

Cornelius B. Philip of the Public Health Service Laboratory at Hamilton, Mont., recently spent a few days at the Museum, working with Doctor Stone on mosquitoes and Tabanidae.

A series of specimens, supposedly Microbracon brevicornis (Wesm.), which were recently received for verification of the determination, contained individuals that appeared to be inseparable from the closely related M. hebetor (Say). M. brevicornis is best known as a parasite of the European corn borer; M. hebetor, as a cosmopolitan parasite of lepidopterous larvae infesting stored grain products and stored fruits. In an attempt to determine definitely if these two forms, which have been much confused, are actually distinct, C. F. W. Muesebeck had occasion to examine a considerable quantity of material from several different sources. The following general conclusions may be stated as a result of his study: In the male sex hebetor and brevicornis are frequently indistinguishable; but, except perhaps for extremely rare cases in which complete intergradation may occur as the result of unusual influences, the females appear to be definitely separable. Accordingly it is believed that M. hebetor and M. brevicornis are to be considered as distinct races at least, if not distinct species.

L. J. Milne, a Harvard University graduate student working on caddisflies with the intent ultimately to prepare a handbook on the North American species of this order, spent several days early in January with A. N. Caudell, going over the Trichoptera collection in the National Museum.

H. E. Ewing has established a second record for the southern dog louse, based on his identification of two specimens collected at McAlester, Okla. The species was described in 1929 by E. A. McGregor as Trichodectes floridanus, from specimens collected in Florida.



## INSECT PEST SURVEY AND PUBLIC RELATIONS

Reporting on correspondence relating to insects not indigenous to the United States, J. A. Hyslop says, "The notes from Egypt contained a report of infestation of corn by the European corn borer at Rosetta and Port Said, which was said to extend greatly the known eastward range of this insect. According to K. Babcock, however, this insect has been known previously from this far east. Entomologist A. M. Mistakawi of Egypt has reported obtaining a very good control of mole crickets by using a zinc phosphide bait. He does not mention the formula, however."

## BEE CULTURE

Action delayed on bee-marketing agreement.---Jas. I. Hambleton of the Somerset, Md., laboratory and Warren Whitcomb, Jr., and E. Oertel, of the Southern States laboratory, attended the annual meeting of the Southern States Beekeeping Conference at New Orleans, December 11-12. The three likewise assisted at the public hearing on the tentative marketing agreement for package bees, queens, and nuclei, held in that city by the Agricultural Adjustment Administration. The marketing agreement was thoroughly discussed during the business sessions of the Southern Conference and several minor changes in the agreement were recommended. Consequently, when the public hearing was held, no opposition developed. The hearing was well attended by the shippers from all the principal shipping States, with the exception of California. Present also were several buyers of package bees from the North and representatives of the bee press, but neither shippers nor producers of package bees presented any objections at the hearing. It is customary for the Agricultural Adjustment Administration to grant an interval of 10 days after the public hearing for filing briefs either for or against a proposed agreement. This interval has elapsed but no action has as yet been taken by the A.A.A. There appears to be some controversy between the Government and the firm having the contract for furnishing stenographers at such hearings, and consequently the transcript of the hearing has not yet been received. For this reason it has been impossible for the A.A.A. to take any further action. Shippers regret this delay, as they are exceedingly anxious that business done in 1934 be under the proposed marketing agreement.

E. L. Sechrist and G. H. Vansell of the Davis, Calif., laboratory reported an enthusiastic meeting of the California State Beekeepers' Association at Modesto, Calif., on December 12-14. The question of a marketing agreement for bee products was considered but it was the general consensus of those present that the contemplated marketing



agreement is so involved and covers such a wide territory that its administration would be extremely difficult, if not impossible. In the consideration of the marketing agreement, the question arose as to the number of beekeepers and colonies in the State, and in checking on the last census figures for bees and honey it was found that out of 85 beekeepers who were present only 14 had been covered by the census enumerators.

New shipping cage not accepted by southern shippers.--The single-screen shipping cage for package bees which was submitted by the Bee Culture Laboratory to the Post Office Department, referred to in the December 1933 Monthly Letter, was not acceptable to the shippers who were given an opportunity to examine it at the meeting of the Southern Conference in New Orleans, December 11-12. The principal objection being that it was too heavy and too costly to make. Since then, the shippers have submitted, through the Bee Culture Laboratory, another cage which the Post Office Department now has under consideration.

Increased interest in honey grades.--Mention was made in a previous issue of the Monthly Letter of a packer in Delaware who was using the United States Grades on retail packages of honey. Beekeepers generally have been slow to adopt the use of the U. S. grades and it is interesting to note that the Bee Culture Laboratory has already received a reaction from the use of the grades by this large packer. Several smaller packers, whose territories overlap that of the Delaware dealer, have inquired as to the procedure for using the U. S. honey grades.

A new film strip, No. 171, "The Diagnosis of Bee Diseases in the Apiary," by C. E. Burnside, is now available for distribution by the Extension Service. It contains 50 illustrations and is accompanied by lecture notes. The film strip is somewhat disappointing, in that beekeeping disease material does not lend itself well to photographic purposes.

The response received to Farmers' Bulletin 1713, Treatment of American Foulbrood, is very gratifying. Many officials in charge of State apiary inspection have written to the office expressing their satisfaction with the recommendations this bulletin embodies. To date

only one State apiary inspector had objected to the bulletin and his objection was raised over only one provision, the correspondent intimating that the bulletin could not be used in his State as it recommends the salvaging of honey from infected colonies under certain circumstances.

A. P. Sturtevant and C. L. Farrar of the Intermountain Bee Culture Laboratory, Laramie, Wyo., prepared an exhibit showing the experimental work of the laboratory for the benefit of visitors who attended the Colorado-Wyoming Academy of Science which met in Laramie, December 1-2.

A memorandum of understanding has been drawn up between the University of California and the Bureau of Entomology for work on western beeswax. The work will be done largely in the chemical laboratory of the University's Department of Chemistry.



only one State agency responsible for the collection and the  
analysis of water samples and the provision of the information to the  
public. The National Sanitation Conference has been in the State of the  
sanitary condition of the water supply and the quality of the water  
supply.

A. E. Stevenson and C. E. Jones of the International Sanitation  
Conference, San Francisco, California, presented an exhibit showing the  
work of the laboratory for the analysis of water and the methods of  
analysis. The exhibit showed the methods of analysis of water and the  
methods of analysis of water and the methods of analysis of water.  
A description of the laboratory for the analysis of water and the  
methods of analysis of water and the methods of analysis of water.  
The work will be done mainly in the chemical laboratory of  
the University of California at Berkeley.